Analysis conducted:

We conducted several runs of the Hatfield Model with varying assumptions about plant lives in order to analyze two different matters:

1. In an attempt to achieve an "apples-to-apples" comparison of the two models, we replaced the Hatfield default plant lives with our best estimate of the BCM2 default depreciation rates, i.e., the FCC's approved lives for the state of Utah.[40] Table 2.4 summarizes this comparison of the results of the Hatfield Model run using the Hatfield Model default depreciation values with the results of the Hatfield Model using our proxy for the BCM2 default depreciation values.[41] As Table 2.4 shows, the average cost yielded by the Hatfield Model is lowered by $0.24 when the assumed BCM2 values are used instead of the Hatfield Model default. This in turn causes the USF requirement (at $30) to decline by approximately 3.3% for the state of Utah.

Table 2.4

Impact of Using BCM2 Depreciation Lives in the Hatfield Model

Utah

USF Requirement	**Hatfield Model Default**	**FCC-approved Lives**
$20 Benchmark	$25,899,082	$25,208,237
$30 Benchmark	16,404,975	15,858,296
$40 Benchmark	9,636,172	9,449,121
Average Cost	$21.11	$20.87

Assumption: The FCC-approved depreciation rates are those incorporated in the BCM2.

40. 1995 Depreciation Rates, Report and Order, Utah Docket No. 95-049-22, Issued April 4, 1996.

41. Table 2.5 provides further disaggregation by density zone.

Table 2.5

Impact of Using BCM2 Depreciation Lives in the Hatfield Model

Disaggregated by Density Zone

Utah

Density Zone	Hatfield Model Default				FCC-approved Lives			
	$20 Benchmark	$30 Benchmark	$40 Benchmark	Average Cost	$20 Benchmark	$30 Benchmark	$40 Benchmark	Average Cost
Less 5	$12,146,812	$10,891,492	$9,636,172	$116.76	$11,959,761	$10,704,065	$9,449,121	$115.27
5 to 200	13,375,643	5,513,483	0	37.01	13,018,750	5,154,231	0	36.56
200 to 650	376,627	0	0	20.63	229,726	0	0	20.38
650 to 850	0	0	0	17.42	0	0	0	17.22
850 to 2550	0	0	0	17.09	0	0	0	16.90
Greater 2550	0	0	0	16.18	0	0	0	16.01
Total USF Support	$25,899,082	$16,404,975	$9,636,172	$21.11	$25,208,237	$15,858,296	$9,449,121	$20.87

2. The depreciation lives that regulators approve for basic local exchange service can directly affect the size of a universal service fund. To illustrate the importance of regulators' decisions, we conducted two runs of the Hatfield Model on Utah data. For one run, we set plant lives at those sought by US West in a recent PUC proceeding,[42] and for the second run, we set plant lives to correspond with those approved by the Utah PUC. As Table 2.6 shows, the difference in the average cost yielded by these two runs is $0.81.[43] The USF requirement is 7.4%, 8.9%, and 4.7% higher for price thresholds of $20, $30, and $40, respectively when the depreciation lives that US West sought are used relative to the depreciation lives that the Utah PUC approved. The results of this analysis underscores the significance of regulators' evaluation of ILECs' requests to shorten the lives of network components.

Table 2.6

Impact of Varying the Depreciation Lives in the Hatfield Model

Utah

USF Requirement	US West Proposed	PUC Approved
$20 Benchmark	$27,177,848	$25,305,809
$30 Benchmark	17,357,908	15,943,445
$40 Benchmark	9,927,586	9,480,962
Average Cost	$21.71	$20.90

42. Utah Public Service Commission Docket No. 95-049-22, *In the Matter of the Request of US West Communications, Inc. for Approval of Changed Depreciation Rates*, Report and Order, April 4, 1996.

43. Table 2.7 provides further disaggregation by density zone.

Table 2.7

Impact of Varying the Depreciation Lives in the Hatfield Model

Disaggregated by Density Zone

Utah

Density Zone	US West Proposed				PUC Approved			
	$20 Benchmark	$30 Benchmark	$40 Benchmark	Average Cost	$20 Benchmark	$30 Benchmark	$40 Benchmark	Average Cost
Less 5	$12,438,226	$11,182,906	$9,927,586	$119.08	$111,991,602	$10,736,282	$9,480,962	$115.53
5 to 200	14,037,162	6,175,002	0	37.85	13,069,323	5,207,163	0	36.62
200 to 650	702,460	0	0	21.17	244,884	0	0	20.41
650 to 850	0	0	0	17.92	0	0	0	17.24
850 to 2550	0	0	0	17.61	0	0	0	16.92
Greater 2550	0	0	0	16.71	0	0	0	16.03
Total USF Support	$27,177,848	$17,357,908	$9,927,586	$21.71	$25,305,809	$15,943,445	$9,480,962	$20.90

Source: 1995 Depreciation Rates, Report and Order, Utah Docket No. 95-049-22, April 4, 1996.

Recommendations and findings:

- From an operational point of view, given the divergence of decisions among regulators regarding depreciation rates, and the significance of this cost component to the results of a model, depreciation rates should be user-specified variables, as is the case in the Hatfield Model.

- From a policy perspective, as we stated in our April and August Reports,[44] the depreciation rates that are reflected in a universal service cost proxy model should be appropriate for basic local exchange service. It would be entirely inappropriate for universal service funding to cross-subsidize ILECs' entry into competitive services. If regulators use lives that are unnecessarily short in a cost proxy model for basic local exchange service, the results of such model will be excessive. Using what we have assumed to be the lives reflected in the BCM2 in our run of the Hatfield Model, slightly lowered the cost relative to the Hatfield Model default.[45]

Recommended question for the BCM2 sponsors regarding depreciation

Background: The Sponsors contend that they have used depreciation lives that have been approved by regulators.[46] However, it is unclear whether these lives reflect both federal and state decisions, and if so, how the decisions are weighted between the interstate and intrastate jurisdiction, given that the cost results of the BCM2 are expressed on an unseparated basis. Furthermore, the BCM2 does not include state-specific cost factors, and thus, presumably the Sponsors have computed national averages for the various accounts.

Question:

1. Provide a table with account-specific data that show the lives reflected in the BCM2.

2. Are the approved lives those authorized by the FCC or the PUC, or both? If the latter, how are the depreciation lives weighted to reflect differing decisions by the FCC and state PUCs?

44. April Report at 67-69 and August Report at 22.

45. As a point of clarification, the BCM2 does not use state-specific figures (but rather presumably computes weighted national average lives), but for the purposes of our evaluation, we have conducted state-specific runs.

46. Benchmark Cost Model 2 Methodology at 18.

Recommended questions for the Hatfield Model sponsors regarding depreciation

Background: The Sponsors have not provided justification for the default values shown. The lives are short relative to those that regulators have approved.

Questions: 1. What is the justification for the lives shown in a universal service cost proxy model?

Non-plant-related expenses

As we discussed in the August Report, the BCM2 includes 75% of $133.39 per year, or approximately $8.34 per month per line to reflect non-plant-related expenses such as marketing and customer operations, etc.[47] There is not an explicit counterpart number in the Hatfield Model, although the 10% overhead figure (which is user-specified) presumably reflects similar expenses. As we demonstrated in the August Report, zeroing out this component reduces the monthly average cost yielded by the BCM2 for Washington State (leaving all other algorithms and default values intact) from $29.41 to $21.07.

Recommendations and findings

- As stated in the August Report, policy makers should reject the BCM2's non-plant-related expense factor and only include expenses that sponsors can demonstrate to support basic local exchange service.[48] Although there is not a directly comparable monthly figure in the Hatfield Model, the 10% overhead factor in the Hatfield Model appears to reflect more accurately a reasonable share of overhead costs that should be attributed to basic local exchange service.

"Equalizing" the carrying charge factor across models

The previous sections of this chapter examine each of the three major components of the carrying charge factor *separately*. In order to evaluate the overall combined impact of these three components on the results of the cost proxy models, we developed runs that

47. August Report at 24 and 29-40.

48. For example, as stated in the August Report, marketing expenses are unrelated to primary line basic local exchange service, and marketing expenses incurred by ILECs to support their sale of *second* lines to households have nothing to do with universal service.

enabled us to compare all three factors *in tandem*. Specifically, we considered two different ways to achieve comparability of carrying charge factor inputs in the two models.

1. In order to mimic the BCM2 default values in the Hatfield Model, we ran the Hatfield Model on the state of Utah with the following substitute values:

    a. Rate of return of 11.25% (instead of the less costly 10.01%)

    b. Depreciation lives corresponding with those approved by the FCC for the state of Utah (instead of the generally shorter and thus more costly lives assumed by the Hatfield Model Sponsors)

    c. Overhead factor of 20% (instead of the lower, less costly default overhead factor of 10%) as a proxy for substituting the BCM2's non-plant-related expense cost of $8.34 (per month) in the Hatfield Model.[49]

    We also ran the BCM2 for the state of Utah only for US West.

Table 2.8 below summarizes these results and shows that this attempt to "equalize" the carrying charge factor significantly reduces the gap in the average cost per line that the models yield. The "default" gap between the Hatfield Model and BCM2 of $8.65 is reduced to a gap of $4.85 when these cost factor related changes are made to the Hatfield Model.

49. The analysis shown reflects a 20% overhead factor for illustrative purposes. We have not conducted a precise mapping of the non-plant-related expense factor in the BCM2 to the overhead factor in the Hatfield Model.

Table 2.8

Impact of Running the Hatfield Model with BCM2-Based Carrying Charge Factors

Utah

Benchmark Level	**Hatfield Model (Revised Cost Factor)**	**BCM2 Default**
$20	$33,528,270	$68,281,721
$30	22,419,609	28,827,635
$40	13,302,129	17,036,751
Average Cost Per Line	$23.97	$28.82

2. Simply compare the results of the two models expressed in investment dollars, i.e., before the carrying charge factor is applied. Clearly the carrying charge factor explains a substantial portion of the significantly different results of the two models. One way to isolate the impact of this difference is to compare the investment costs yielded by the two cost proxy models. Although this report does not encompass such an analysis, this area merits further examination.[50]

Recommended questions for the BCM2 and Hatfield Model sponsors regarding the carrying charge factor

1. Is the 0.346 service order processing fraction of Account 6623 the residential portion?

50. In the discussion of outside plant in Chapter 4, however, we do provide some investment-related comparisons.

Table 2.9

Comparison of BCM2 and Hatfield Model Cost Factors and Inputs

BCM2	**Hatfield Model**
1995 ARMIS data used • to calculate historical maintenance expense to investment relationship • to calculate regulatory-approved depreciation lives • to calculate annual cost per line	1995 ARMIS data used • to calculate expense to investment ratios for different plant categories • economic lives are <u>adjustable</u> inputs by plant category, with a 50 year maximum - default settings range from 7 to 20 years; straight-line depreciation method used, cash flow in arrears assumed; tax rate = 0.40

Table 2.9

Comparison of BCM2 and Hatfield Model Cost Factors and Inputs

BCM2	Hatfield Model
• FIT (35%); state and local taxes • Plant Specific Expenses Motor Vehicle Aircraft Special Purpose Vehicle Garage Work Eqpmt. Other Work Eqpmt. Land & Building Furniture & Artwork Office Eqpmt. General Purpose Eqpmt. Analog Electronic Eqpmt. Digital Electronic Eqpmt. Electro-Mechanical Operator Systems Eqpmt. Radio Systems Eqpmt. Circuit Eqpmt. Station Apparatus Large PBX Public Telephone Term. Eqpmt. Other Term. Eqpmt. Pole Aerial Cable Underground Cable Buried Cable Submarine Cable Deep Sea Cable Intrabuilding Network Cable Aerial Wire Conduit Systems	*Inputs* (all user adjustable) • Taxes - other taxes (principally franchise fees) = 0.050 - operating state and local income tax factor = 0.010 • Forward-Looking Expense Factors - network operations = 0.700; - alternative CO switching = 0.0269 - alternative circuit eqpmt. = 0.0153 • Structure Assignment Factors - plant structure (conduit, poles and trenches) to be shared by service providers; default = 0.33 for aerial, UG, buried feeder and distribution facilities

Table 2.9

Comparison of BCM2 and Hatfield Model Cost Factors and Inputs

BCM2	Hatfield Model
• Plant Non-Specific Expenses PHFU Provisioning Power Network Admin. Testing Plant Operations Admin. Engineering • Customer Operations—Marketing Product Management Sales Product Advertising • Customer Operations—Services Call Completion Number Services Customer Services • Corporate Operations Executive Planning Accounting & Finance External Relations Human Resources Information Mgmt. Legal Procurement Research & Development Other Gen. & Admin. Prov. for Uncoll. • Access Expense	• Plant Non-Specific Expenses: Provisioning Power Network Admin. Testing Plant Operations Admin. General Support Equipment

Table 2.9

Comparison of BCM2 and Hatfield Model Cost Factors and Inputs

BCM2	Hatfield Model
- plant non-specific expenses used to calculate an annual cost per line = $133.39, adjustable - allocation factor = 0.75, to associate non-plant related services with local service, adjustable	- in correlation to BCM2's non-plant specific expenses, the Hatfield Model uses a variable overhead factor = 0.100 - actual 1995 investments used to determine investment ratio; this ratio is multiplied by network investment estimated by the model - recurring costs calculated in same way as recurring costs for network investment
• Depreciation/Amortization - no specific depreciation rate or expected life used in computation of costs - 1995 ARMIS data used to derive historical ratio of depreciation expense to the gross investment for cable & wire facilities, circuit equipment, and switching equipment - these factors multiplied by relative plant investments to derive depreciation costs	• Depreciation - economic lives are adjustable inputs by plant category - default settings range from 7 to 20 years, with a 50 year maximum - straight-line depreciation method - cash flow in arrears assumed, i.e, return from assets, tax gross-ups and depreciation applied at year end - tax rate = 0.40

Table 2.9 Comparison of BCM2 and Hatfield Model Cost Factors and Inputs	
BCM2	**Hatfield Model**
	Explicit Values for Cost Per Line • LNP (local number portability) = $0.25/month • billing/bill inquiry = $1.22/month • directory listing = $0.15/month • NID maintenance expense = $3.00/NID/year • carrier-to-carrier customer expense (for UNE costs) = $1.56/year, based on 1995 ARMIS data Other: • service order processing fraction of 6623 = 0.346 • EO traffic-sensitive fraction = 0.70 • DS-0/DS-1 crossover = 24 • DS-1/DS-3 crossover = 28 • Switch line circuit offset per DLC line = $35.00

Table 2.9

Comparison of BCM2 and Hatfield Model Cost Factors and Inputs

BCM2	**Hatfield Model**
Capital Structure (3) Adjustable investment related factors: • cable and wire facilities = 0.23276 • switching equipment = 0.25703 • circuit equipment = 0.24241 Rate of Return = 11.25%	*Capital Structure* Adjustable Parameters: • debt fraction = 0.45 • cost of debt = 0.077 • cost of equity = 0.119 debt fraction * cost of debt 0.45 * 0.077 = 0.035 equity fraction * cost of equity (1-0.45) * 0.119 = 0.065 Rate of Return = 10.01%

3 AN ASSESSMENT OF THE HATFIELD MODEL'S SWITCHING COST MODULE

The Hatfield Model calculates switching related investment costs within its Wire Center Investment Module. The Wire Center Module computes investment in wire centers, switching (including end offices, tandems, and operator tandems), signaling, and interoffice transmission facilities.[51] The model determines switching and interoffice capacity sufficient to serve all demand in the service area studied. The output is then used in the Convergence Module, which combines the output of the Loop Module with that of the Wire Center Module.

Specifically, the Wire Center Module estimates the following:[52]

Switching and wire center investment: includes investment in local and tandem switches, and investments in wire center facilities (including buildings, land, power systems and distributing frames).

Signaling network investment: investment in STPs, SCPs and signaling links.

Transport investment: investment in transmission systems supporting local interoffice (tandem and direct) trunks, intraLATA toll trunks (tandem and direct) and access trunks (tandem and direct).

Operator systems investment: investments in operator systems positions and operator tandems. It allows the operator positions to be located at a distance from the operator tandem.

The Hatfield Model introduces a higher level of detail and calculations in its Wire Center Module than BCM2 in its revised Switching Cost Module. While the BCM2 only accounted for some of these investments through the use of specific factors or ratios (e.g.,

51. Hatfield 2.2.2 at 10.

52. *Id.*, at 22.

the Interoffice Switching Ratio), the Hatfield Model details the various parameters involved and applies them in the Module calculations. Table 3.1 below provides a comparison of the detail involved in both models in order to calculate switching costs.

Table 3.1

Comparison of BCM2 and Hatfield Switching Costs

BCM2			Hatfield Model	
Switch	**Fixed**	**Per Line**	**EO Switching Parameters**	
Remote	$250,000	$100	Busy hour call attempts, residential	1.3
10,000	$400,000	$100	Busy hour call attempts, business	3.5
60,000	$600,000	$100	Switch Maximum Line Size	100,000
100,000	$900,000	$100	Switch Maximum Line Fill	.80
500,000	$1,500,000	$100	Switch Maximum Processor Occupancy	.90
			Processor Feature Loading Multiplier	1.00
Switching Interoffice Investment Ratio		1.03	Switch Installation Multiplier	1.10
			Switch Parameters	
Switching Engineering Factor		1.07	Switch real-time limit, BHCA	
			1 - 1,000	10,000
Land and Building Factor		1.043	1,000 - 10,000	50,000
			10,000 - 40,000	200,000
Switching Equipment Discount		20%	40,000 +	600,000
			Switch traffic limit, BHCS	
Non-Traffic Sensitive		70%	1 - 1,000	10,000
			1,000 - 10,000	50,000
Traffic- Sensitive (local)		73.9%	10,000 - 40,000	500,000
			40,000 +	1,000,000

	Residential Holding Time Multiplier	1.00
	Business Holding Time Multiplier	1.00
	Busy Hour fraction of daily usage	.10
	Annual to daily usage reduction factor	270.00
	Interoffice and Tandem Parameters	
	Operator Traffic Fraction	0.02
	Total Interoffice Traffic Fraction	0.65
	Direct-Routed Fraction of Local Interoffice	0.98
	Maximum Trunk Occupancy, CCS	27.5
	Trunk Termination Investment, per end	$100
	Average Direct Route Distance, miles	10
	Average Trunk Usage Fraction	0.3
	Toll Traffic inputs	
	Tandem-routed % of total intraLATA traffic	0.2
	Average direct intraLATA route distance	25
	Tandem-routed % of total interLATA traffic	0.2
	Average direct access route distance, mi.	15
	Tandem Switching parameters	
	real time limit, BHCA	1,500,000
	port limit, trunks	120,000
	common equipment investment	$1,000,000

	maximum trunk fill	0.8
	maximum real time occupancy	0.9
	common equipment intercept factor	0.25
	Signaling Parameters	
	STP Link Capacity	720
	STP Maximum Fill	.8
	STP Investment, per pair, fully equipped	$5,000,000
	STP common equipment investment, per pair	$1,000,000
	Link Termination, both ends	$900.00
	Signaling Link Bit Rate	56,000
	Link Occupancy	.4
	C Link Cross-Section	24
	ISUP messages per interoffice BHCA	6
	ISUP message length, bytes	25
	TCAP messages per transaction	2
	TCAP message length, bytes	100
	Fraction of BHCA requiring TCAP	.1
	SCP investment per transaction per second	$20,000.00

Hatfield Model Wire Center Parameters	
Lot size, multiplier of switch room size	2
Tandem/EO wire center common factor	0.40
Power and frame investment	sum of power and frame
0	$10,000
1,000	$20,000
5,000	$40,000

25,000	$100,000
50,000	$500,000
Switch Room size table	floor area required
0	500
1,000	1,000
5,000	2,000
25,000	5,000
50,000	10,000
Construction costs, per sq ft	construction/$/Sq ft
0	$75
1,000	$85
5,000	$100
25,000	$125
50,000	$150
Land price, per sq ft	price/sq ft
0	$5.00
1,000	$7.50
5,000	$10.00
25,000	$15.00
50,000	$20.00

The following discussion summarizes the major differences between the switch components of the Hatfield Model and the BCM2.

- The BCM2 separates switches into four size categories, with breakpoints at 10,000, 60,000, 100,000 lines and fixed costs ranging from $400,000 to $1,500,000. The BCM2 applies a host/remote switching category, based upon existing switch architecture. Remote switching units (RSUs) have a lower fixed cost than the stand-alone option.

- In the Hatfield Model, switches are sized by adding up all switched lines and comparing the total to the user specified maximum allowable switch line size. The model uses a default of 100,000 lines and a fill factor of 0.8, which yields a maximum effective switch line size of 80,000. If the wire center serves greater than the maximum of 80,000, then two equally sized switches are used. For example, if a wire center serves 90,000 lines, the model will compute the investment required for two 45,000 line switches. If multiple switches are required in the wire center, they are sized equally to allow for maximum growth on both switches.[53]

- In the Hatfield model, per line investment figures include the entire end-office switch, including trunks and ports. Hatfield 2.2.2 corrected the previous per line switching investment, since it "double counted" trunk ports. This correction resulted in a $16 decrease in per line investment (see Figure 3.1 for corrected comparison of switching investment curves). Although the BCM2 and the Hatfield Model switching investment curves are similar and very close, the Hatfield Model still results in lower average costs (i.e., using the default values, Hatfield produces lower switching investment costs).

- Whereas the Hatfield model incorporates a digital switching discounts up to 50% to the costs used, the BCM2 applies a 20% switching equipment discount (see Figure 3.1 for comparison of switching investment curves using the default settings). The digital switching discount factor is user-adjustable in the BCM2 model but not in the Hatfield model. As a way to render the results of the Hatfield Model and the BCM2 more comparable, we reran the BCM2 using a 50% digital switch discount (rather than the default 20% discount). Figure 3.2 provides the results of this sensitivity run of the BCM2 and demonstrates that the BCM2 and the Hatfield Model produce, in fact, very similar switching investment costs.

- The Hatfield model switching investment input assumptions "include aggregate pricing information for host and remote switches in addition to that for stand-alone end office machines."[54] While the Hatfield Model uses average costs, the BCM2 is more precise in that it specifically categorizes remotes as a choice for switch type. One of the concerns we raised in our April and August Reports was that the BCM and the BCM2 failed to recognize the forward-looking deployment of remote switches. Both the Hatfield Model and the BCM2 seem to rely on existing switch classifications.

---

53. Hatfield 2.2.2 at 24.

54. AT&T and MCI Responses, August 19, 1996, at 13.

Figure 3.1

Comparison of Switching Investment Curves - BCM2, BCM and Hatfield Default Values

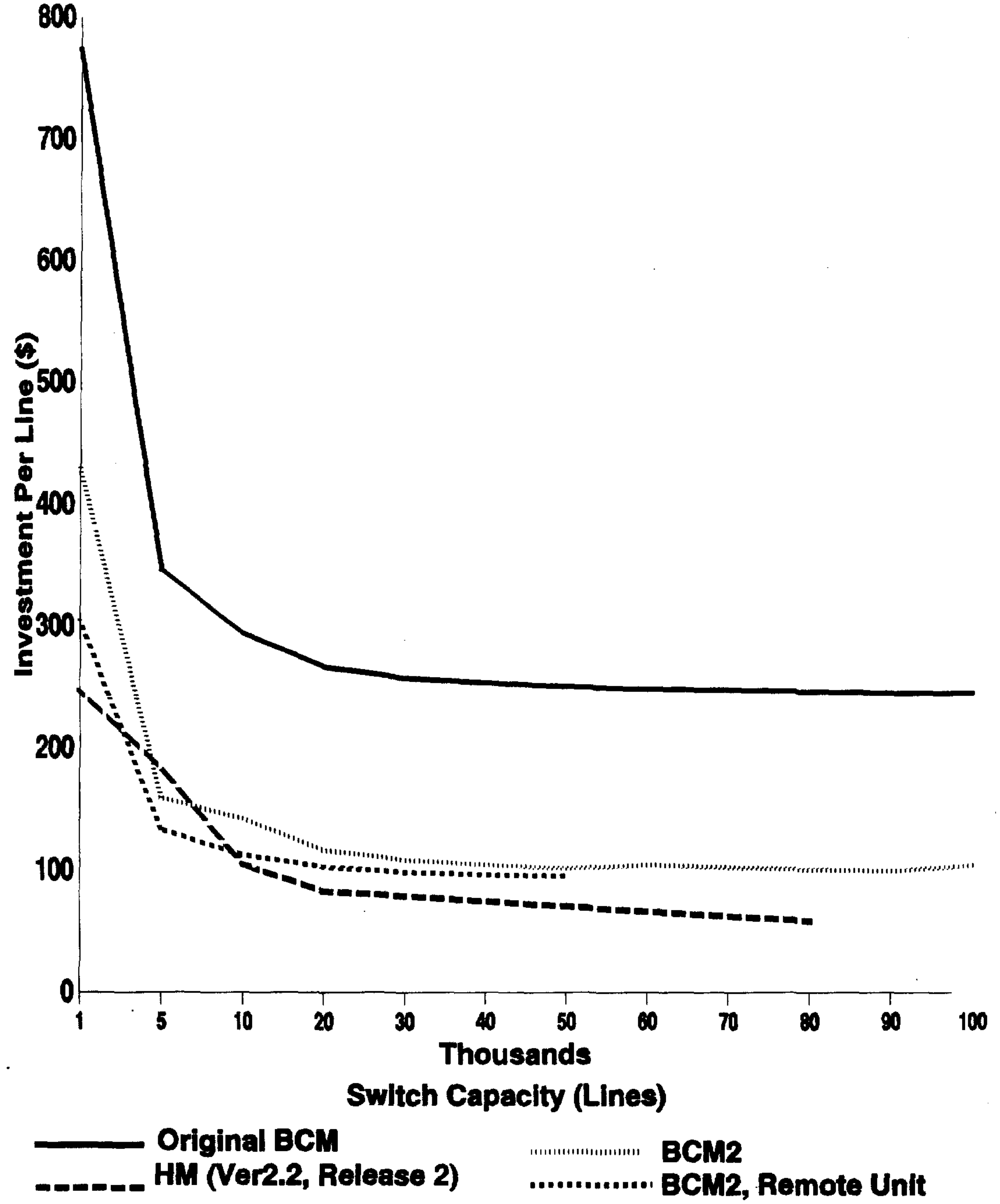
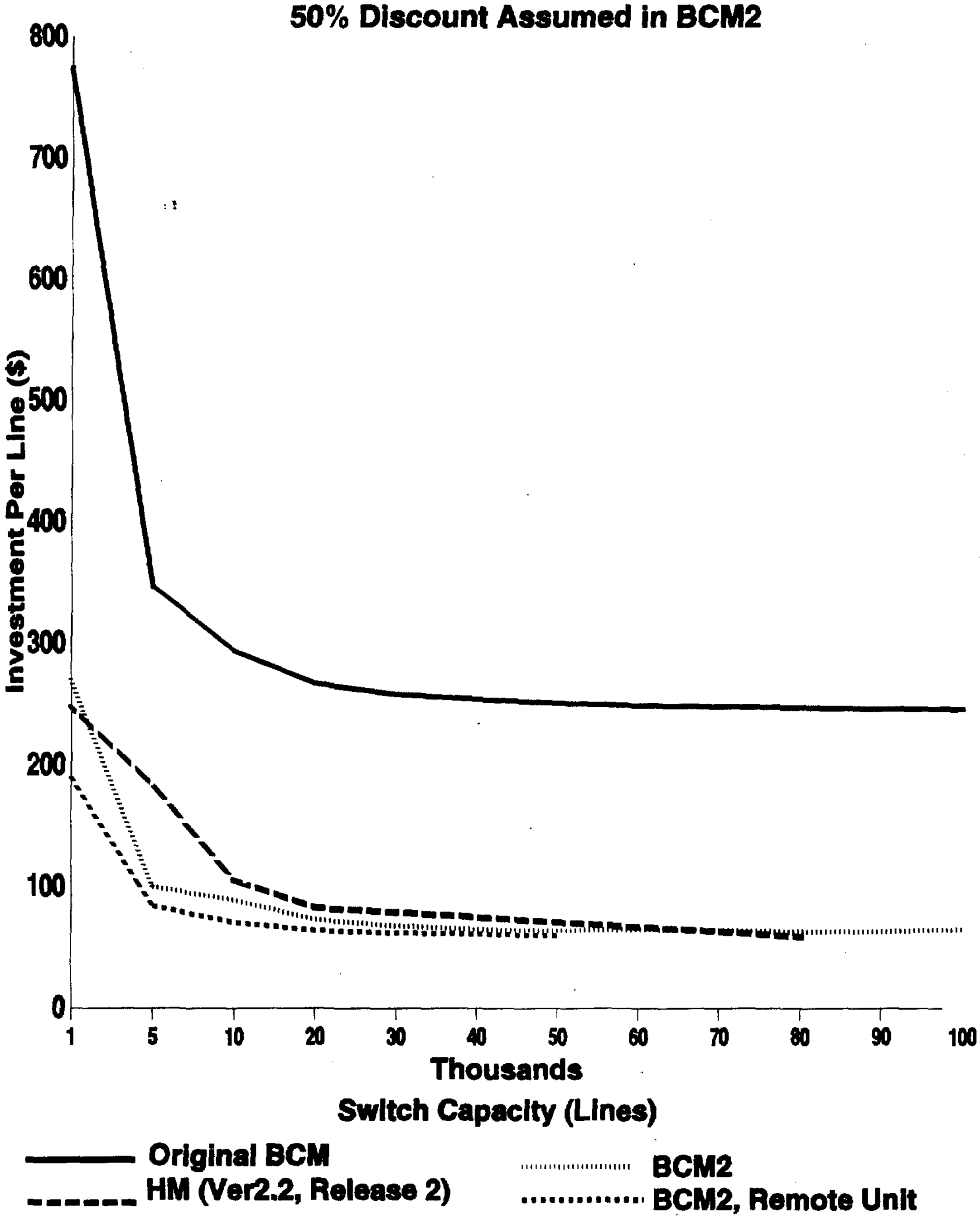


Figure 3.2
Comparison of Switching Investment Curves - BCM2, BCM and Hatfield
50% Discount Assumed in BCM2



- As a way to gauge the significance of the relative deployment of remote switches, we ran the BCM2 on the state of Washington with an exaggerated scenario: all wire centers except those serving more than 60,000 lines are served with remotes (i.e., fixed cost of $250,000 for remote switches was applied up to 60,000).[55] Because this analysis did not encompass a cross-comparison, *per se*, with the Hatfield Model, we did not strip away the independent territories from the Washington data set. The results of this run show that, in the state of Washington, the aggregate support for all benchmark levels and by density zones, decreases slightly when remotes are deployed in wire centers up to 60,000 lines see Tables 3.2 and 3.3 for detailed results). The deployment of remote switching units is particularly important since, according to the BCM2 data, they may provide the most efficient investment. In addition, switch consolidation may be a cost saving practice that should be accounted for in a cost proxy model.

Table 3.2

Impact of Increasing the Deployment of Remote Switches

Washington Aggregate Support - BCM2

USF Requirement	Default Deployment	Widespread Deployment
$20 Benchmark	$279,458,563	$274,522,417
$30 Benchmark	$131,124,029	$127,823,020
$40 Benchmark	$76,625,614	$74,520,715
Average Cost	$29.41	$29.19

55. We are in no sense suggesting that this is technically feasible or desirable, but have simply conducted this run as a way to bound the potential impact of this attribute on the USF question.

Table 3.3

Increasing the Deployment of Remote Switches

Disaggregated by Density Zone

Washington - BCM2

Density Zone	Default Deployment			Widespread Deployment		
	$20 Benchmark	$30 Benchmark	$40 Benchmark	$20 Benchmark	$30 Benchmark	$40 Benchmark
Less 5	$21,721,579	$19,429,819	$17,138,059	$21,314,955	$19,023,195	$16,731,435
5 to 200	$148,306,401	$99,779,891	$59,263,654	$146,128,341	$97,653,702	$57,586,470
200 to 650	$29,126,941	$4,187,327	$58,677	$28,377,624	$3,808,705	$45,454
650 to 850	$10,427,775	$1,172,565	$27,762	$10,213,130	$1,081,032	$25,584
850 to 2550	$48,504,146	$4,406,936	$38,606	$47,443,394	$4,154,904	$33,709
Greater 2550	$21,371,732	$2,147,497	$98,861	$21,044,973	$2,101,481	$98,062

- The Hatfield Model's methodology to average out switching costs results in uniform cost for ports, end office usage, signaling and transport regardless of density zones. At this time, we can not determine why these costs are the same across density zones (we would expect higher costs in low density areas).

- The BCM2 distinguishes between the fixed costs per switch (e.g., processor and frame investments) and the per line costs (e.g., line cards). For the fixed portion of the switch, the BCM2 assigns 70% to the non-traffic sensitive (NTS) category and 30% to traffic sensitive (TS). All of the NTS investment is assigned to local service. Of the TS investments, the BCM2 assigns 74% to local service, based on the proportion of local to non-local traffic. Consequently, 92% of the total end office switching investments are included in the cost of local service calculated by the BCM2, with the remaining 8% assumed to be recovered from non-local services.[56] In contrast, the Hatfield Model does not distinguish local versus non-local or TS versus NTS for purposes of assigning end office switching costs. As a result, all other things being equal, the Hatfield Model appears to somewhat over-

56. Specifically, the non-local TS investment equals 7.8% [1-(.70+(.30x.74))].

state local switching investment because it effectively assigns 100% of end office switching investments to local service. Relative to the BCM2, this difference in cost allocation increases the Hatfield Model's end office switching costs for local service by 8.5%.[57]

- To compare the level of detail in the Hatfield Model with the use of aggregated factors in the BCM2, we attempted to do various runs to understand the impact of the different methodologies. Specifically, we tried to "zero-out" or use very small values as inputs for the switching, interoffice, tandem and wire center parameters in the Wire Center Module. Unfortunately, we were not able to conduct the runs successfully. Nevertheless, we have evidence which suggests that the aggregate factors used by BCM2 are most likely comparable with the detailed parameters in Hatfield. According to information submitted in New Jersey, one of the Hatfield Model developers was responsible for suggesting the 3% interoffice default ratio.[58]

Recommendations and findings

- The switch costs yielded by the BCM2 and the Hatfield Model are similar.[59] Furthermore, switch costs comprise a small percentage of the overall cost of basic local exchange service. Therefore, policymakers should focus their scrutiny on the differences between the Hatfield Model's and the BCM2's theoretical deployment of outside plant.

- Operationally, the BCM2 offers greater user flexibility in costing out the switch component of basic local exchange service because it permits the deployment of remote switches and allows a user to change the discount for digital switches.

- A cost proxy model should reflect the forward-looking classification of switches; i.e., if the deployment of remote switching units and if the trend toward switch consolidation represents a less costly alternative, to the extent feasible, switch modules should reflect these trends.

57. Specifically, $100 \div (100-7.8) = 8.5\%$.

58. New Jersey Docket No. TX95120631, Response of James D. Dunbar, United Telephone Company of New Jersey, to AT&T's First Set of Interrogatories, Question 28, September 9, 1996.

59. In the April Report, we discussed at length the flawed excessive switch cost that was incorporated in the original BCM. The switch cost modelled by the BCM2 is substantially less.